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## (54) Environmental cleaning machine

(57) An environmental cleaning machine for collecting toxic or radioactive waste has a housing (2) with two compartments. One compartment (25) encloses a suction fan (4), a pre-filter (36), and a main filter (18). The other compartment (14) has an inlet (6) through which air is drawn into a dust-collecting filter bag assembly (10, 12), after which the air passes through an aperture (20) to the filters (36) and (18). When a lid (16) is removed to enable the filter bag assembly to be replaced, the suction fan (4) can be switched ON to remove any dust disturbed and suck it through the aperture (20), so that no dust is spilt.

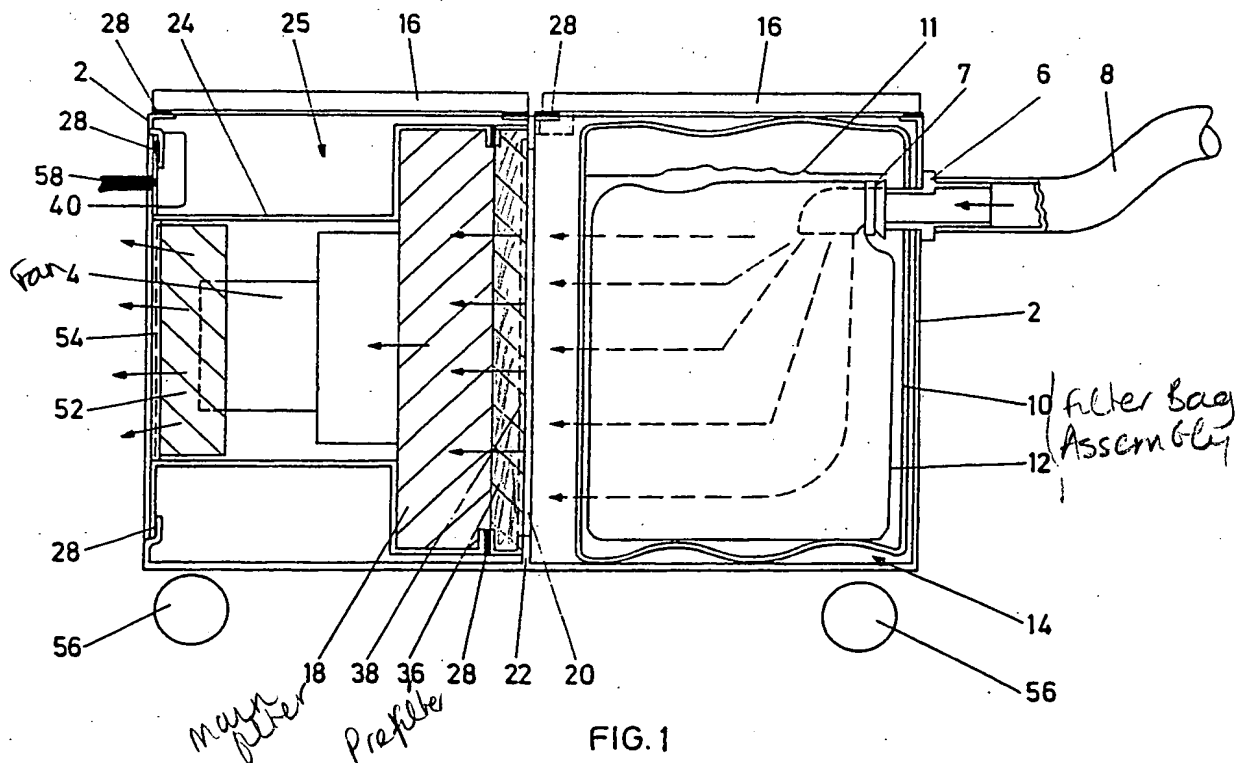


FIG. 1

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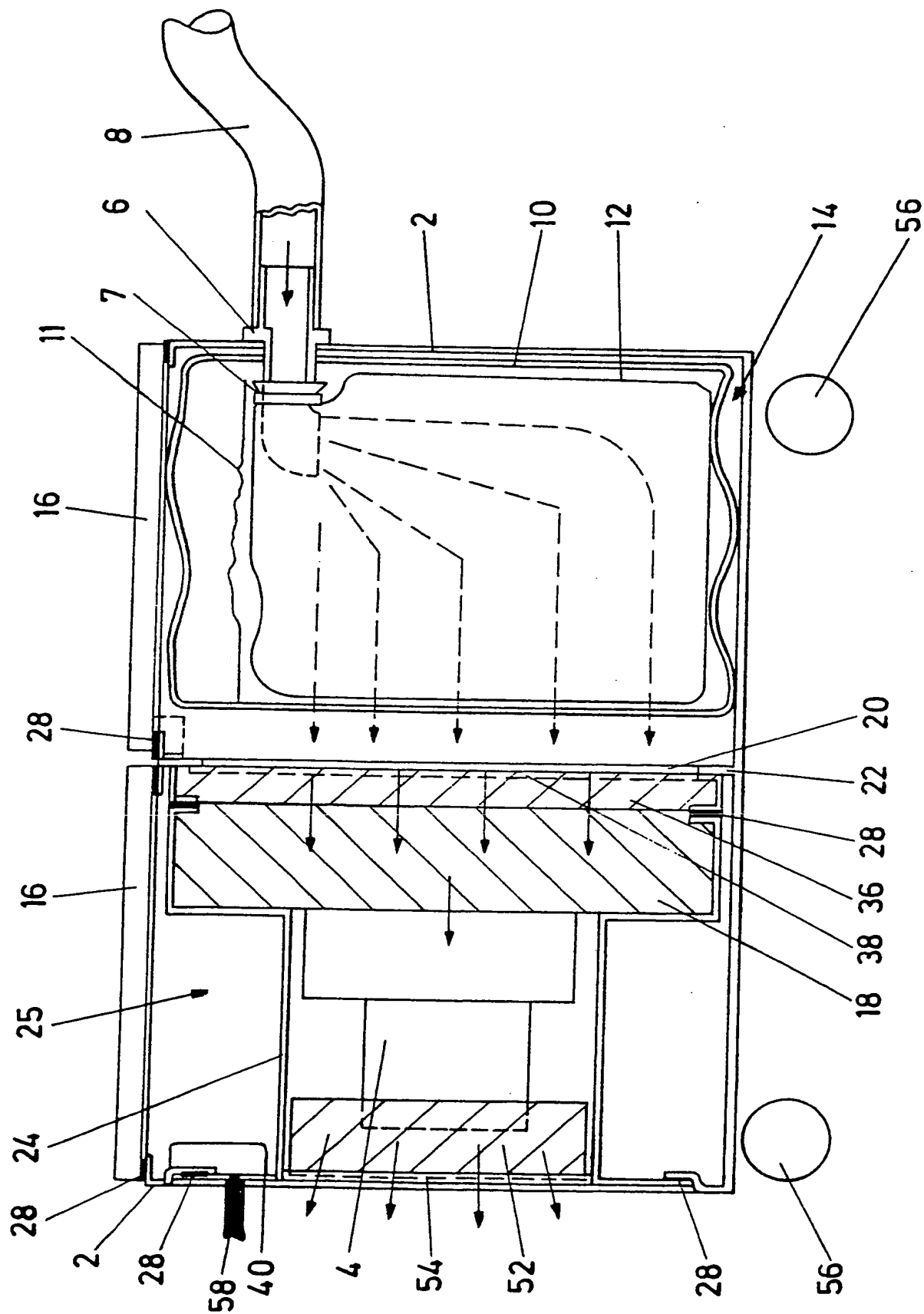


FIG. 1

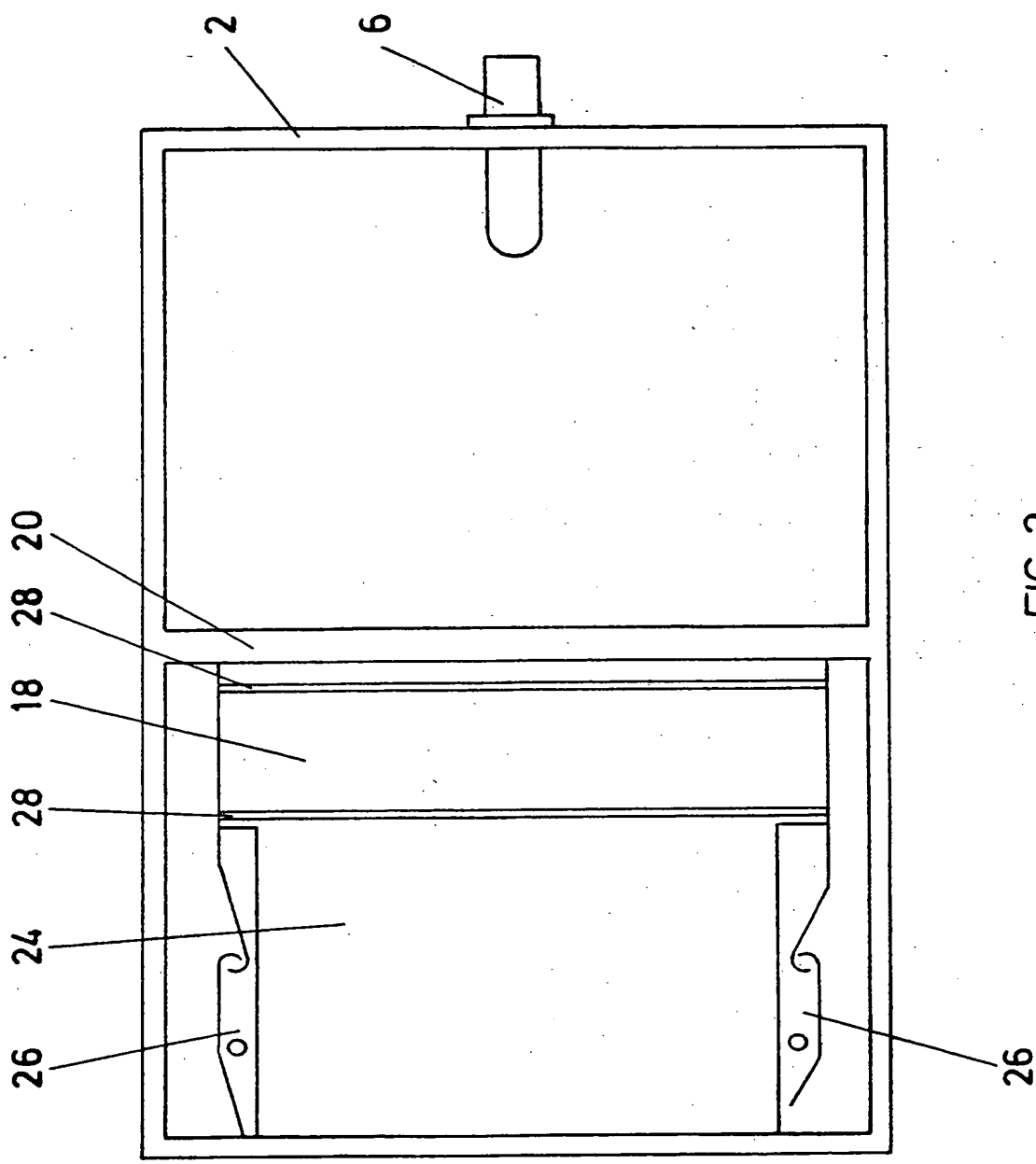


FIG.2

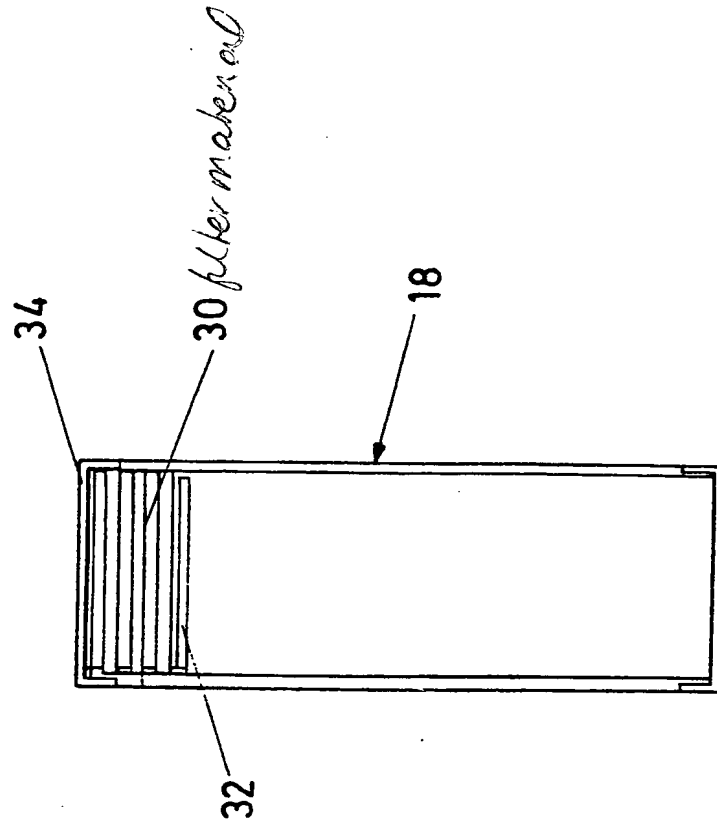


FIG. 4

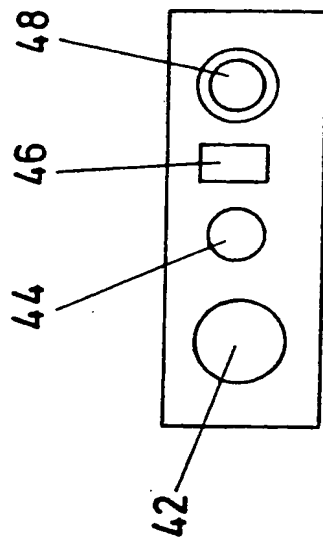


FIG. 3

## SPECIFICATION

### Environmental cleaning machine

#### 5 *Field of invention*

##### *Description*

The invention relates to environmental cleaning machines for removing dust and particulate matter from the environment and in particular to mobile machines for removing toxic or carcinogenic materials such as radioactive dust and asbestos.

##### *Background of invention*

Environmental cleaning machines are known in which air is sucked through a paper bag in a pressure resistant, generally cylindrical container by a motor mounted on a lid of the container. There are also known such machines in which air is sucked from such containers by a hose by a suction fan mounted on a frame, with the air passing through an extra filter to remove fine particles. The suction fan is cooled by air from a separate filtered source. Such machines have manifested some draw backs. They are bulky, do not achieve effective filtration in all cases and most importantly removal of the bag can lead to a disturbance of settled dust inside the container or bag and lead to re-contamination of the atmosphere. The special precautions which have to be taken complicate operation.

The invention aims to provide an improved environmental cleaning machine. Amongst the objects are to provide a compact, efficient machine which is easy to operate and to decontaminate.

#### 35 *Summary of invention*

According to the invention there is provided an environmental cleaning machine having a suction fan for drawing air through an opening for a suction conduit into a removable container located in a compartment with a lid which is removable for replacement of the container, and hence through a filter past the fan for exhausting to atmosphere in which an inlet for the filter is provided in the compartment wall through which air can be drawn to the filter by the suction fan when the lid is removed for container replacement.

The filter inlet is associated with the compartment and not the lid and remains capable of sucking dust from the compartment when the lid is removed. The dust containers, generally bags, can be removed without re-contamination of the atmosphere. Any dust released can be sucked into the filter.

The invention can be given effect in a novel and efficient arrangement in which there is provided a housing having a dividing wall defining the compartment on one side and a compartment for the suction fan and the filter on the other side to facilitate de-contamination of the exterior of the housing. The housing preferably has rectangular walls so as to provide a constructionally rigid box structure divided basically into a suction fan and filter compartment and the dust container department. The rectangular configuration permits air to pass from the container bag to the filter through the

dead spaces in the corner. Efficient airflow can be achieved almost in a straight line from the container to the filter.

Advantageously the suction fan is positioned on the aforementioned straight line, preferably in an arrangement in which the filter and suction fan are jointly removable from the housing. Suitably the filter is located immediately behind the inlet and has substantially rectangular outline to provide a large air flow section. Suction and filtering can be created efficiently. Filters may be used which are efficient and have a high flow resistance without increasing the suction fan capacity greatly, because the inline air flow arrangement ensures efficient use of the suction fan capacity.

Conveniently the filter is a filter having filter material in zig-zag formation spaced apart by a suitable spacer material and jointly retained in a rectangular frame.

Preferably the inlet has mounted on it a pre filter for removing medium-sized particles. This greatly prolongs the life of the main filter particularly where there is a considerable disturbance or dust on replacing the dust containers. To preserve the air flow efficiency, suitably the inlet and pre-filter occupy substantially the whole of the dividing wall surface.

Considerable benefit can be derived, in the context of the invention by employing an arrangement in which the suction fan is a through flow fan for cooling by the fan exhaust air and the suction air flow through the machine is substantially in a straight line without passing through hoses or other flow restrictions. The suction fan can be cooled without requiring additional airflows for cooling.

Operation of the machines of the invention can be facilitated greatly by providing a variable suction fan speed to enable suction to be adapted to a substrate; by switching the suction fan ON automatically when the lid is removed; and by providing a filter for the positive pressure side of the fan to diffuse the exhaust air and catch any debris of the motor brushes.

Other features of the invention will be apparent from the specific description.

#### *Drawings*

Figure 1 is a schematic section through an environmental cleaning machine of the invention;

Figure 2 is a plan view of the machine of Figure 1 with lids removed;

Figure 3 shows a control panel for the machine of Figure 1; and

Figure 4 is schematically a section through a filter of the machine of Figure 1.

#### *Specific description*

With reference to the Figures, an environmental cleaning machine has a housing 2 supported on wheels 56. Air is sucked in through a hose 8 by a fan powered through cable 58. The machine can thus be readily moved to a desired working position.

A housing inlet 6 is mounted in a wall opening

of the housing 2 for connection at one end to the hose 8 and at the inside end to a dust collection bag 12, generally of paper inside a cloth bag 10 with zipper opening 11. The housing 2 has a dividing wall 22 and the bags 10 and 12 are located inside 4 compartment 14 to which access can be gained by a removable lid 16. The inside bag 12 can be connected to the inlet 6 by a rubber strap 7.

The other compartment 25 formed by the dividing wall 22 contains a main filter/suction fan assembly clipped together by over centre clips 26. The wall 22 has a large square inlet 20 covered by a metal lattice 38 and a filter 36 forming a pre-filter. The assembly contains a square main filter 18, a through-flow fan 4 in a suitable housing 24 and an after filter 52 behind a further metal lattice 54. The housing 24 mounts a control panel 40 for controlling the fan 4 which lies on housing portion received in a recessed part of the housing 2. Another lid 16 provides access from above.

Seals 28 space lids 16, the housing 2, the motor housing 24, main filter 18, and pre-filter 36. Tightening of securing screws (not shown) locates all parts in the appropriate position.

The filter 18 (see Figure 4) contains a zig-zag arrangement of filter material 30 spaced by a metal corrugated spacer 32 inside a frame 34. The control panel 40 (see Figure 3) contains a pressure gauge for compartment 14, a suction fan speed control 44, and ON-OFF switch and a port 48 for the electric power cable 58. A switch 50 can energise the suction fan 4 on removal of the lid 16 from compartment 14.

The housing 2 is sufficiently rigid to withstand the internal vacuum. The arrangement is compact, makes efficient use of the suction fan and permits safe replacement of the dust collecting bag 12.

In modified arrangements other fans of suitable power may be used and other filter arrangements. The fan and main filter may be separately mounted on a dividing panel.

The bag 12 can be replaced by unscrewing the lid 16, switching on the fan 4, unzipping the bag 10 and replacing the bag 12. Any dust disturbed will be contained in the compartment 14 and sucked into the pre-filter 36, safeguarding the main filter 18. The filter 36 can be exchanged by undoing screws at the front of the housing 2 securing the fan housing 24 to the recessed part of the housing 2, removing the assembly and then replacing the pre-filter 36. The main filter 18 can be exchanged similarly but additionally the clips 26 are undone so as to separate the suction fan 4 and filter 18.

## 55 Claims

1 An environmental cleaning machine having a suction fan for drawing air through an opening for a suction conduit into a removable container located in a compartment with a lid which is removable for replacement of the container, and hence through a filter past the fan for exhausting to atmosphere in which an inlet for the filter is provided in the compartment wall through which air can be drawn to the filter by the suction fan when

the lid is removed for container replacement.

2 A cleaning machine according to claim 1, in which there is provided a housing having a dividing wall defining the compartment and a compartment for the suction fan and the filter on the other side to facilitate de-contamination of the exterior of the housing.

3 A cleaning machine according to claim 2 which the housing has rectangular walls.

4 A cleaning machine according to claim 2 or Claim 3, in which the filter and suction fan are jointly removable from the housing.

5 A cleaning machine according to claim 4 in which the filter and suction fan are mounted clamped between the dividing wall and an opposed housing wall.

6 A cleaning machine according to any of claims 2 to 5 in which the filter is located immediately behind the inlet and has a substantially rectangular outline to provide a large air flow section.

7 A cleaning machine according to claim 6 in which the filter is a filter having filter material in zig-zag formation spaced apart by a suitable spacer material and jointly retained in a rectangular frame.

8 A cleaning machine according to any of the preceding claims, in which the inlet has mounted on it a pre-filter for removing medium-sized particles.

9 A cleaning machine according to claim 2 and claim 8 in which the inlet and pre-filter occupy substantially the whole of the dividing wall surface.

10 A cleaning machine according to any of the preceding claims, in which the suction fan is a through-flow fan for cooling by the fan exhaust air and the suction air flow through the machine is substantially in a straight line without passing through hoses or other flow restrictions.

11 A cleaning machine according to claim 10 in which the removable container is a paper bag which is contained in a cloth bag.

12 A cleaning machine according to any of the preceding claims, in which a means for measuring flow resistance across the filter is provided to permit monitoring of the filter condition.

13 A cleaning machine according to any of the preceding claims, in which a suction fan speed control is provided.

14 A cleaning machine according to any of the preceding claims, in which a means is provided for switching the suction fan ON when the lid is removed.

15 A cleaning machine according to any of the preceding claims in which a filter is provided for air exhausted by the suction fan for diffusing exhaust air.

16 An environmental cleaning machine substantially as shown in and as described with reference to the drawings.